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EFFECTS OF THE LOAN-TO-DEPOSIT RATIO OF THE HONG KONG BANKING SECTOR ON DOMESTIC INTEREST RATES

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Abstract

This paper examines empirically how different local interest rates would respond to tighter liquidity conditions, measured by a higher Hong Kong dollar loan-to-deposit ratio. The findings confirm that under the Linked Exchange Rate System, HIBORs track closely LIBORs in the long term. There could still be short-term deviations between the Hong Kong dollar and US dollar interbank rates, reflecting in part domestic liquidity conditions. For time deposit and mortgage rates, while their values are partly determined by US interest rates through their impact on HIBORs, local market conditions, including liquidity and loan demand, also play significant roles.

JEL classifications: E43; G21
Key words: Currency Board System, Hong Kong, Interbank interest rates

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The views and analysis expressed in the paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.

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EXECUTIVE SUMMARY:

- *The loan-to-deposit (LTD) ratio of the Hong Kong banking sector has risen significantly in recent quarters, reflecting a change in domestic liquidity conditions, from previously an overly abundant level to a more normal level. The impact on different types of domestic interest rates varied. While HIBORs remained soft and followed broadly their US counterparts, there were upward pressures on Hong Kong dollar time deposit rates, and banks' mortgage rates.*

- *Against this background, this paper investigates empirically the potential effect of a higher Hong Kong dollar LTD ratio on different domestic interest rates, including HIBORs, the weighted time deposit rate (TDR) and effective mortgage rate (EMR).*

- *The empirical results generally indicate that tighter liquidity conditions, measured by a higher Hong Kong dollar LTD ratio, would exert upward pressures on local interest rates. The findings confirm that under the Linked Exchange Rate System, HIBORs would track closely their US counterparts in the long term. There could however be short-term deviations, which reflect the risk premium of the Hong Kong dollar over the US dollar, and domestic liquidity conditions. For TDR and EMR, while their values are in part determined by US interest rates through their impact on HIBORs, local market conditions, including liquidity and loan demand, also play significant roles.*

- *Specifically, the impact on HIBORs is estimated to be tangible only when the Hong Kong dollar LTD ratio is already over 90%. With this pre-condition, a rise in the ratio would generate a transitory effect on HIBORs, which in general lasts for less than six months. In other words, HIBORs would initially rise in response to an increase in the ratio, but then return close to their original levels. The impact is estimated to be non-linear with an increasingly larger effect when the LTD ratio is initially in a higher region.*

- *Unlike HIBORs, the TDR and EMR would respond to tighter domestic liquidity at all levels of the ratio, and the impact is estimated to be sustainable, reflecting the relatively less tight relationship between domestic retail rates and their US counterparts.*

- *To gauge how a tightening of domestic liquidity conditions would affect local interest rates, the analysis assumes an initial value of the Hong Kong dollar LTD ratio at 90% and estimates the impact of an increase in the ratio by 10 percentage points. The results indicate that:*

- *The expected short-term impact on interbank interest rates ranges from a 95-basis-point rise in the overnight HIBOR to a 195-basis-point increase in the one-month HIBOR, while the estimates at one-sided 95% confidence level indicate that there is a material chance that the impact would be significantly larger. For instance, the short-term impact on the one-month HIBOR at a 5% likelihood level would be a rise of 320 basis points (bps). Nevertheless, any effect on HIBORs would only be transitory.*

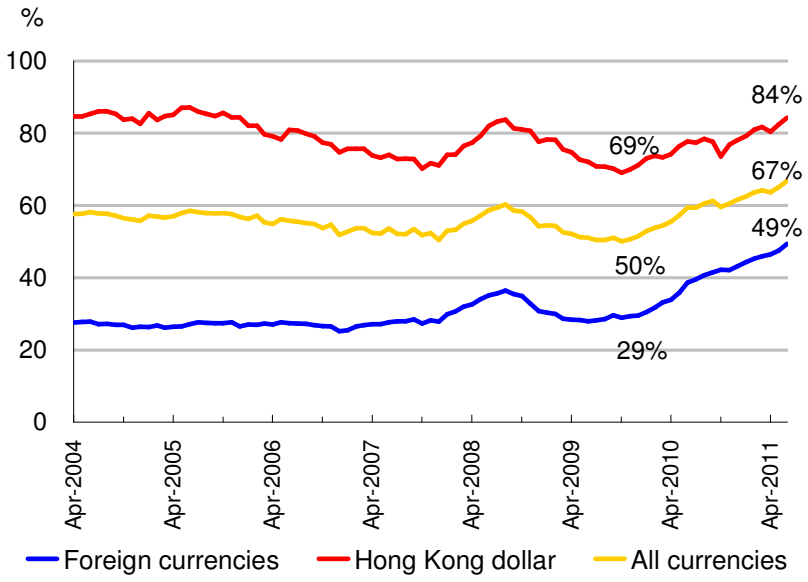
- *For TDR and EMR, the permanent expected impacts are estimated to be 29 and 48 bps respectively. In an extreme scenario at a 5% likelihood level, there would be an increase in TDR and EMR by 119 and 195 bps respectively.*

- *Therefore, even if US interest rates stay at unusually low levels for an extended period, the potential impact of a sudden change in local liquidity conditions on domestic interest rates and its possible consequences merit close attention.*

I. INTRODUCTION

The loan-to-deposit (LTD) ratio of the Hong Kong banking sector has risen significantly in recent quarters, with the all-currency LTD ratio rising from 50% in October 2009 to 67% in June 2011. The rise has been particularly strong in the foreign-currency component, which increased from 29% to 49%, reflecting largely strong demand for US dollar loans. The Hong Kong dollar LTD ratio also rose, albeit at a less rapid pace, from 69% to 84% during the same period (Figure 1).

Figure 1: LTD ratio of all AIs



Source: HKMA.

The recent rise in the LTD ratios reflected a change in domestic liquidity conditions, from previously an overly abundant level to a more normal level. The impact on different types of domestic interest rates varied significantly. While HIBORs remained soft and followed broadly their US counterparts, there were upward pressures on Hong Kong dollar time deposit rates, reflecting keener competition for retail funding among banks. Meanwhile, banks also raised their mortgage rates by charging higher spreads for HIBOR-based plans and promoting more actively their BLR-based mortgages.[2] Against this background, this paper investigates the potential effect of a higher Hong Kong dollar LTD ratio on different domestic interest rates, including HIBORs, the weighted time deposit rate (TDR)[3] and effective mortgage rate (EMR).[4]

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[2] Banks have reportedly raised mortgage rates since November 2010. The development was reported in the Hong Kong Economic Times on 13 May 2011 and 17 September 2011.

[3] The TDR is defined as the weighted average of time deposit rates by the outstanding amounts of time deposits at different maturities in the Hong Kong banking sector. So, the TDR in this study reflects mainly the average cost of time deposits rather than time deposit rates quoted by individual banks in the market.

[4] In this study, we examine the impact of Hong Kong dollar LTD ratio on the effective approval rates for BLR-based mortgages, but not the HIBOR-based rate, as a sufficiently long data series is only available for the former. However, the estimation results should also be applicable to HIBOR-based EMR.

II. THE MODELS AND EMPIRICAL FINDINGS

Under the Linked Exchange Rate System (LERS), HIBORs should closely track their US counterparts (i.e. LIBORs) in the long term. Short-term deviations between HIBORs and LIBORs reflect the risk premium (in particular, the exchange rate risk) of the Hong Kong dollar over the US dollar, and domestic liquidity conditions. For TDR and EMR, while their values are in part determined by US interest rates through their impact on HIBORs, local market conditions, including liquidity and loan demand, also play significant roles. Determinants of domestic interest rates are illustrated in Figure 2. Empirical models and estimation results are presented in Annex A, with a summary given in Table 1. The models are estimated using the Engle-Granger method based on monthly data for the period August 1996 to March 2011.

Figure 2: Main determinants of domestic interest rates

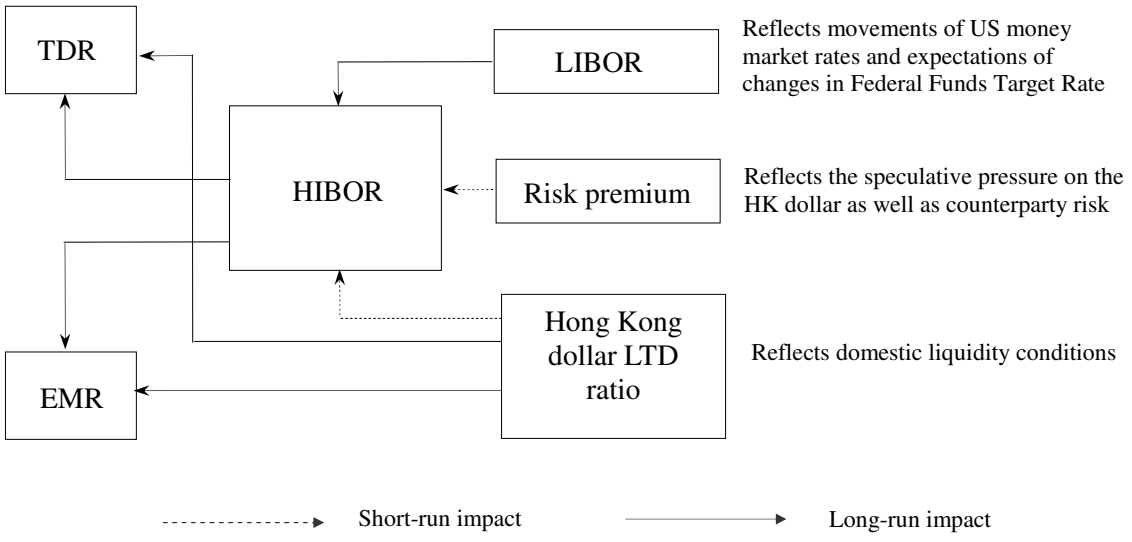


Table 1: The models for HIBORs, TDR and EMR and empirical results

Variables	Main determinants
HIBORs (including overnight, one-month, three-month and 12-month HIBORs)[(a) & (b)]	i. **LIBORs** are estimated to have both long- and short-run impacts on HIBORs with the same maturity. A long-run relationship is found that HIBORs tend to converge to LIBORs. In the short run, a 1% increase in LIBORs would be followed by a rise in HIBORs by less than 1%. ii. **Hong Kong dollar LTD ratio** is estimated to affect HIBORs positively and non-linearly in the short term, with an increasingly larger effect when the ratio is initially at a higher region. The effect is statistically significant only when the ratio exceeds 90%. Any effect arising from the ratio is found to be transitory.
Time deposit rate (TDR) (Represented by weighted time deposit rate)	i. **Three-month HIBOR** is found to have positive long- and short-run impacts on TDR. A 100-basis-point rise in the HIBOR, arising either from changes in the LIBOR or risk premium, would increase TDR by 36 basis points (bps) in the short run and by 76 bps in the long run. ii. **HKD LTD ratio** is estimated to have a positive long-run relationship with TDR.
Effective BLR-based mortgage rate (EMR)	i. **Three-month HIBOR** is estimated to have long- and short-run effects on EMR. A rise in the HIBOR by 100 bps would increase EMR by 78 bps in the long run and by 9 bps in the short run. ii. **HKD LTD** ratio is found to be a significant long-run determinant of EMR, with a higher LTD ratio being associated with a higher EMR. iii. **Property market sentiment**, measured by property prices in the logarithm form, is found to be a long-run factor determining EMR. Higher property prices would exert upward pressures on EMR.

Notes:

(a) For modelling the overnight HIBOR, the Effective Federal Funds Rate is used instead of overnight LIBOR, as a longer time series is available for the former.

(b) A dummy variable, *AFC*, defined as one for the period September 1997 to September 1998 and zero otherwise, is also included in the models to control for the volatile movement of HIBORs during the Asian financial crisis.

Source: Staff estimates.

The empirical results generally indicate that tighter liquidity conditions, measured by a higher Hong Kong dollar LTD ratio, would exert upward pressures on local interest rates, but the impact would differ across the interest rates:

(i) Specifically, the impact on HIBORs is estimated to be tangible only when the Hong Kong dollar LTD ratio is already over 90%.[5] With this pre-condition, a rise in the ratio would generate a transitory effect on HIBORs, which in general lasts for less than six months. In other words, HIBORs would initially rise in response to an increase in the ratio, even when there is no movement in their US counterparts, but would return to close to their original levels.[6] Moreover, the impact is estimated to be non-linear with an increasingly larger effect when the LTD ratio is initially in a higher region.

(ii) Unlike HIBORs, the TDR and EMR would respond to tighter domestic liquidity at all levels of the ratio, and the impact is estimated to be sustainable, reflecting the relatively less tight relationship between domestic retail deposit and lending rates and their US counterparts.

To gauge how a tightening of domestic liquidity conditions would affect local interest rates, the impact of an increase in the Hong Kong dollar LTD ratio by 10 percentage points on HIBORs, TDR and EMR is examined using the estimated models. This analysis assumes an initial value of the Hong Kong dollar LTD ratio at 90%. This initial value is selected because (a) our estimation result shows that there would be apparent upward pressures on HIBORs when the LTD ratio exceeds 90%, and (b) the chance for the ratio to reach 90% in the medium term is not insignificant given that it currently stays at 84%. The assessment results are summarised as follows:

(i) The estimated expected impact on HIBORs and the one-sided 95% confidence level of the estimates are presented in Figure 3. The results indicate that the expected short-term impacts on interbank interest rates range from a 95-bp rise in the overnight HIBOR to a 195-bp increase in the one-month HIBOR.

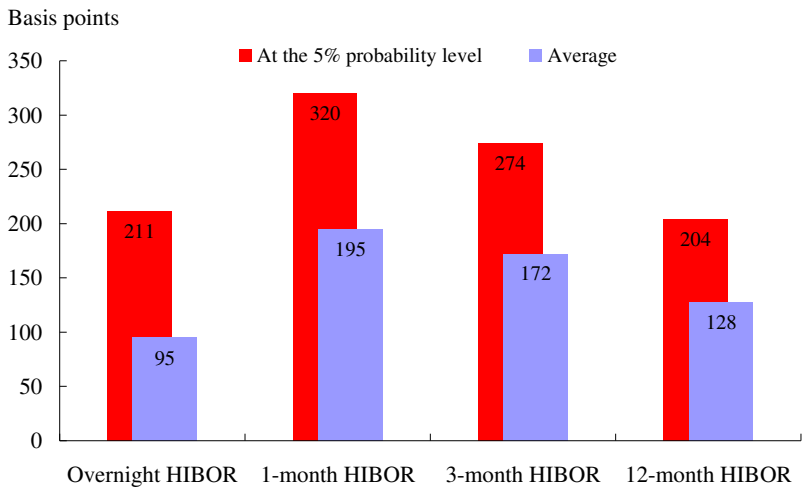
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[5] In other words, when there is plenty of liquidity, with the Hong Kong dollar LTD ratio at below 90%, an increase in the ratio would not have a tangible effect on the interbank rates. It should be stressed that the 90% threshold of Hong Kong dollar LTD ratio for HIBORs to start responding to any further tightness of liquidity reflects the fact that its impact only then becomes tangible. It simply suggests that if there is an abundance of liquidity, a move to a less liquid situation would not have much effect on HIBORs, which track closely interbank rates of US dollar. The finding should not be interpreted as indicating a Hong Kong dollar LTD ratio of over 90% as alarming.

[6] The time for the reverse of rates differs by their maturities.

(ii) The one-sided 95% confidence levels of the estimates indicate that there is a material chance that the impact would be significantly larger than the expected estimates. For instance, the short-term impact on one-month HIBOR at a 5% likelihood level would be a rise of 320 bps.

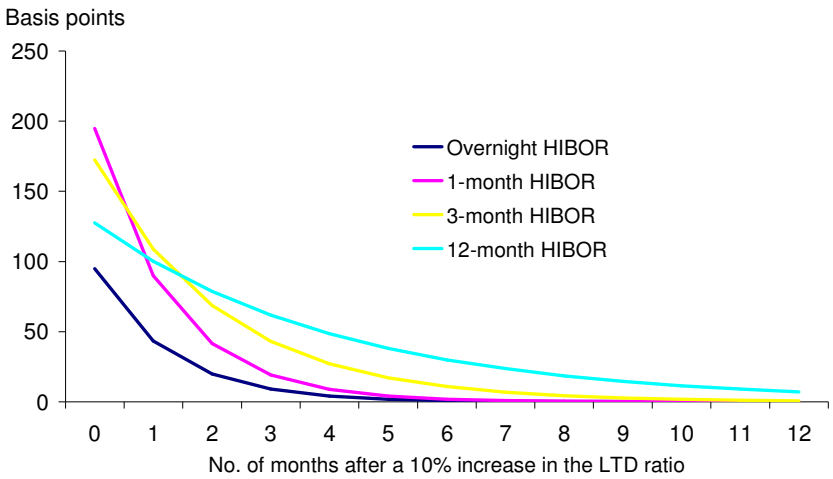
Figure 3: Estimated short-run impacts on HIBORs of an increase in Hong Kong dollar LTD ratio from 90% to 100%



Source: Staff estimates.

Nevertheless, any effect on HIBORs would only be transitory, as the LERS has a force to bring the HIBORs back to their long-run equilibrium levels with their US counterparts (Figure 4). For illustration, when the Hong Kong dollar LTD ratio increases from 90% to 100%, the one-month HIBOR would rise by 195 bps in the same month, but would gradually soften back to the original level in around six months' time.

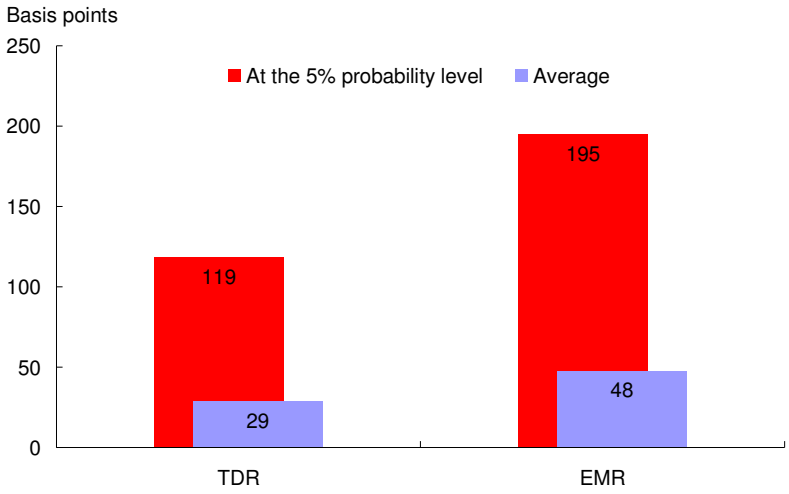
Figure 4: Estimated long-run impacts on HIBORs of a 10 percentage-point increase in Hong Kong dollar LTD ratio (assuming an initial ratio = 90%)



Source: Staff estimates.

For TDR and EMR, the permanent expected impacts are estimated to be 29 and 48 bps respectively (Figure 5). In an extreme scenario, there would be an increase of TDR and EMR by 119 and 195 bps respectively. The latent interest rate risks should therefore not be lightly dismissed.

Figure 5: Estimated permanent impacts on TDR and EMR of a 10 percentage-point increase in Hong Kong dollar LTD ratio



Source: Staff estimates.

III. CONCLUSION

The empirical results generally suggest that a further significant tightening of local liquidity conditions could lead to apparent upward pressures on domestic interest rates. While the effects on HIBORs are estimated to be transitory under the LERS, the impact on time deposit rates and mortgage rates is found to be permanent. Therefore, even if US interest rates stay at unusually low levels for an extended period, the potential impact of a sudden change in local liquidity conditions on domestic interest rates and its possible consequences merit close attention.

Annex

The Empirical Models and Estimation Results

I. Empirical models:

a. The empirical model for HIBORs:

$$\Delta Hibor_t = \alpha + \beta_{LR}(Hibor_{t-1} - Libor_{t-1}) + \beta_1 \Delta Libor_t + \beta_2 \Delta LTD_t + \beta_3 \Delta LTD_t(LTD_t > \theta) + \beta_4 AFC + \varepsilon_t \quad (1)$$

The empirical specification assumes that HIBORs are mainly determined by two factors. First, there is a theoretical long-run relationship between HIBOR and LIBOR, which is captured by the regressor $Hibor_{t-1} - Libor_{t-1}$. Keeping other factors constant, HIBOR will converge to US dollar LIBOR (with the same maturity), with an adjustment speed measured by β_{LR}. LIBOR is also assumed to have a short-run effect on HIBOR, which is measured by the estimated coefficient for $\Delta Libor_t$ (i.e. β_1).

Secondly, the Hong Kong dollar LTD ratio for all AIs, an indicator of Hong Kong dollar liquidity conditions, is postulated to be a significant determinant of HIBORs. The LTD ratio is assumed to affect HIBORs positively and non-linearly. Such a non-linear positive relationship can be estimated by including two regressors, LTD_t and $LTD_t(LTD_t > \theta)$, where $(LTD_t > \theta)$ is a dummy variable defined as one when LTD is larger than a pre-determined threshold θ, and zero otherwise. The coefficient estimates for LTD_t and $LTD_t(LTD_t > \theta)$ (i.e. β_2 and β_3) are expected to be positive. Quantitatively, when LTD is below the threshold, a one unit increase in LTD will produce a marginal effect on HIBORs by β_2. The marginal effect will accelerate to $\beta_2 + \beta_3$ when LTD is above the threshold, reflecting tighter liquidity conditions. Four possible values of θ will be considered (i.e. θ = 80%, 90%, 100% and 110%).

Finally, a dummy variable, *AFC*, defined as one for the period September 1997 to September 1998 and zero otherwise, is included to control for the volatile movement of HIBORs during the Asian financial crisis.

The regression equation is estimated for HIBOR with different maturities (i.e. overnight, one-month, three-month, six-month, nine-month and 12-month).

b. The empirical model for TDR:

$$\Delta TDR_t = \lambda_1 + \mu_{LR} LR\_TDR_{t-1} + \mu_1 \Delta Hibor\_3m_t + \mu_2 \Delta TDR_{t-1} + \omega_t \quad (2)$$

where

$$TDR_t = \lambda_2 + \mu_3 Hibor\_3m_t + \mu_4 LTD_t + LR\_TDR_t \quad (3)$$

The model assumes that there is a long-run relationship between TDR, three-month HIBOR and Hong Kong dollar LTD ratio (see equation (3)). As a higher HIBOR and Hong Kong dollar LTD ratio are expected to generate an upward pressure on TDR, μ_3 and μ_4 are expected to be positive. As for the short-run movement of TDR, equation (2) asserts that ΔTDR_t will respond to its own lag, HIBOR and the error-correction term, LR_TDR_{t-1}.

c. The empirical model for EMR:

The model for EMR is very similar to that for TDR, except that a further assumption that property prices (in logarithm form, i.e. $Log(PP)$) play a significant role in determining EMR is considered in the long-run equation.

$$\Delta EMR_t = \gamma_1 + \pi_{LR} LR\_EMR_{t-1} + \pi_t \Delta Hibor\_3m_t + \pi_2 \Delta EMR_{t-1} + \upsilon_t \quad (4)$$

where

$$EMR_t = \gamma_3 + \pi_3 Hibor\_3m_t + \pi_4 LTD_t + \pi_5 Log(PP_t) + LR\_EMR_t \quad (5)$$

II. Estimation results:

Table A1 presents the estimation result for overnight, one-month, three-month and 12-month HIBOR, and Table A2 presents the estimation results for TDR and EMR.[7] Major estimation results are summarised as follows:

(1) LIBOR is found to be a significant factor affecting HIBOR both in the short- and long-run, as β_1 and β_{LR} are estimated to be statistically

[7] Estimation results for all maturities considered in the study are consistent. For simplicity, the results for six-month and nine-month HIBORs are omitted in the discussion.

significant with expected signs for all models considered. Although HIBORs are estimated to converge to the respective LIBORs, the convergence speed tends to be faster for shorter-term HIBORs, with β_{LR} in general estimated to be larger (in absolute terms) for shorter-term HIBORs.

(2) As for the empirical relationship between HIBOR and LTD, empirical evidence supports that there is a non-linearly positive relationship. Specifically, β_2 is estimated to be insignificant for all models, indicating that the Hong Kong dollar LTD ratio is not a significant determinant of HIBORs when the LTD ratio is low (i.e. below θ). However, there is a significant positive impact of the LTD ratio on HIBOR when the LTD ratio is larger than 90% (see Models B to D).

(3) Importantly, the marginal effect is estimated to increase when the LTD ratio becomes larger. This can be seen by noting that the estimated β_3 increases from Models B to C. The empirical result suggests that when the LTD ratio is larger than 0.9, it tends to produce apparent upward pressure on Hong Kong dollar interbank interest rates, with the effect being more pronounced for higher initial levels of the LTD ratio.

(4) The movements of TDR and EMR have long-run equilibrium relationships with HIBOR and the Hong Kong dollar LTD ratio. Property prices are also found to be a significant long-run factor affecting EMR. This empirical result indicates that liquidity conditions in the domestic banking sector play an important role in determining TDR and EMR.

Table A1: Estimation results for empirical models for HIBORs for various maturities

Overnight HIBOR

Dependent variable: $\Delta Hibor_t$	Model A	Model B	Model C	Model D
α	-0.003 ***	-0.003 ***	-0.003 ***	-0.003 ***
$Hibor_{t-1} - Libor_{t-1}$	-0.541 ***	-0.544 ***	-0.548 ***	-0.552 ***
AFC	0.007 ***	0.007 ***	0.007 ***	0.006 ***
$\Delta Libor_t$	0.911 ***	0.930 ***	0.909 ***	0.932 ***
ΔLTD_t	-0.058	-0.059	-0.045	-0.047
$\Delta LTD_t\ (LTD_t > \theta)$				
$\theta = 0.8$	0.116			
$\theta = 0.9$		0.154 **		
$\theta = 1.0$			0.147 **	
$\theta = 1.1$				0.195 ***
Adjusted R-squared	0.30	0.31	0.31	0.32

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

One-month HIBOR

Dependent variable: $\Delta Hibor_t$	Model A	Model B	Model C	Model D
α	-0.002 ***	-0.002 ***	-0.002 ***	-0.002 ***
$Hibor_{t-1} - Libor_{t-1}$	-0.565 ***	-0.539 ***	-0.533 ***	-0.536 ***
AFC	0.021 ***	0.020 ***	0.020 ***	0.019 ***
$\Delta Libor_t$	0.878 ***	0.898 ***	0.863 ***	0.872 ***
ΔLTD_t	-0.028	-0.037	-0.032	-0.021
$\Delta LTD_t\ (LTD_t > \theta)$				
$\theta = 0.8$	0.126			
$\theta = 0.9$		0.232 ***		
$\theta = 1.0$			0.288 ***	
$\theta = 1.1$				0.489 ***
Adjusted R-squared	0.362	0.380	0.390	0.419

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

Three-month HIBOR

Dependent variable: $\Delta Hibor_t$	Model A	Model B	Model C	Model D
α	-0.001 **	-0.001 **	-0.001 **	-0.001 **
$Hibor_{t-1} - Libor_{t-1}$	-0.394 ***	-0.370 ***	-0.365 ***	-0.367 ***
AFC	0.017 ***	0.017 ***	0.017 ***	0.016 ***
$\Delta Libor_t$	0.861 ***	0.881 ***	0.859 ***	0.870 ***
ΔLTD_t	-0.004	-0.008	-0.004	0.009
$\Delta LTD_t\ (LTD_t > \theta)$				
$\theta = 0.8$	0.102			
$\theta = 0.9$		0.180 **		
$\theta = 1.0$			0.225 ***	
$\theta = 1.1$				0.353 ***
Adjusted R-squared	0.336	0.353	0.362	0.381

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

Twelve-month HIBOR

Dependent variable: $\Delta Hibor_t$	Model A	Model B	Model C	Model D
α	0.000	0.000	0.000	0.000
$Hibor_{t-1} - Libor_{t-1}$	-0.229 ***	-0.214 ***	-0.212 ***	-0.216 ***
AFC	0.014 ***	0.014 ***	0.014 ***	0.013 ***
$\Delta Libor_t$	0.851 ***	0.869 ***	0.861 ***	0.887 ***
ΔLTD_t	0.007	0.011	0.011	0.018
$\Delta LTD_t\ (LTD_t > \theta)$				
$\theta = 0.8$	0.076			
$\theta = 0.9$		0.116 **		
$\theta = 1.0$			0.156 ***	
$\theta = 1.1$				0.251 ***
Adjusted R-squared	0.365	0.375	0.385	0.403

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

Table A2: Estimation results for empirical models for TDR and EMR

Effective mortgage rate (EMR)

Estimation results for EMR	
Dependent variable: ΔEMR_t	
γ_1	0.000
$\Delta Hibor\_3m_t$	0.087 ***
ΔEMR_{t-1}	0.523 ***
LR_EMR_{t-1}	-0.079 ***
Adjusted R-squared	0.535

Estimation results for long-run relationship for EMR	
Dependent variable: EMR_t	
γ_2	-0.063 ***
$Hibor\_3m_t$	0.775 ***
$log(PP_t)$	0.010 ***
LTD_t	0.048 ***
Adjusted R-squared	0.899

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

Weighted time deposit rate (TDR)

Estimation results for TDR	
Dependent variable: ΔTDR_t	
λ_1	0.000
$\Delta Hibor\_3m_t$	0.362 ***
ΔTDR_{t-1}	0.211 ***
LR_TDR_{t-1}	-0.061 **
Adjusted R-squared	0.723

Estimation results for long-run relationship for TDR	
Dependent variable: TDR_t	
λ_2	-0.029 ***
$Hibor\_3m_t$	0.757 ***
LTD_t	0.029 ***
Adjusted R-squared	0.950

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.